



COMPARISON OF CLINICAL EFFICACY OF ALOE VERA CONTAINING TOOTHPASTE WITH CONVENTIONAL FLUORIDATED TOOTHPASTE IN PLAQUE-INDUCED GINGIVITIS

Dr. Namrata J. Suthar¹ | Dr Rizwan M. Sanadi² | Dr. Laksha R. Chelani³ | Dr. Suvidha Vilas Dere¹

¹ MDS, Periodontology and Implantology.

² Professor, Department of Periodontics, Y.M.T Dental College and Hospital.

³ PG student 3rd year, Department of Periodontics, Y.M.T Dental College and Hospital.

ABSTRACT

Aim: To evaluate the clinical efficacy of aloe vera containing toothpaste and compare with conventional fluoride toothpaste as an adjunct to scaling in plaque induced moderate to severe chronic gingivitis patients.

Settings and Design: Study was randomized, controlled cross over clinical trial.

Material and Methods: Sixty subjects in the age group of 18-35 years with moderate to severe chronic gingivitis were selected for the study. They were randomly assigned in to aloe vera group and conventional group having 30 subjects each. An analysis of PI, GI, SBI and OHI were carried out at baseline and after 2 weeks and 4 weeks followed by a washout period of 2 weeks. After the washout period, the aloe vera and conventional group were crossed over and the assessments were repeated.

Statistical analysis used: The change in mean scores of various indices over a period of 4 weeks in each group before and after crossover were analyzed using Repeated measures ANOVA test. Intergroup comparison was done using unpaired 't' test.

Results: On intra-group comparison statistically significant reduction in all parameters were observed at 4 weeks when compared to baseline before and after crossover in both aloe vera and conventional group. However on intergroup comparison there was no statistically significant difference between the aloe vera and conventional group.

Conclusions: Aloe vera toothpaste was as effective as conventional fluoridated toothpaste in reduction of plaque and gingival inflammation. Hence it can be concluded that aloe vera toothpaste may be useful chemical plaque control agent in gingivitis patients.

KEY WORDS: Aloe vera, clinical trial, plaque, chronic gingivitis, randomized controlled, cross over.

INTRODUCTION:

The role of dental plaque in the initiation of gingivitis and periodontitis has been, and continues to be, the focus of extensive study and research. Plaque control and prevention of gingivitis is the main goal of prevention of periodontal diseases. At present mechanical methods of dental plaque removal are widely regarded as being a highly effective means of helping to control progression of periodontal diseases. Mechanical plaque control is time consuming and some individuals may lack motivation for these procedures. The inability of the general adult population to perform adequate tooth brushing has led to the search for chemotherapeutic agents to improve plaque control^[1]. These chemicals, mainly triclosan and chlorhexidine, have been used as mouthrinses or added to dentifrices to avoid plaque formation and development of gingivitis^[1,2,3]. Because some of these substances may have undesirable side effects, such as tooth staining and taste alteration, phytotherapeutic agents with antimicrobial and anti-inflammatory properties have been investigated.^[4]

Herbal dentifrices are available and have been evaluated in clinical trials for controlling plaque and gingivitis. Of various plant extracts used as a base for dentifrices, aloe vera deserves a special mention as it has recently been introduced in dentistry after years of use in medical field. Aloe vera abounds with aloferon, which acts on tissue healing. It contains acemannan, which is a mucopolysaccharide with antiviral, antifungal and antimicrobial action. It also contains anthraquinone, which is an antiseptic substance.^[5] Along with the ease of availability, no known adverse effect and cost effectiveness, make aloe vera an ideal candidate for plaque control, thereby reducing gingivitis and most likely eventual periodontitis.

Hence a study was conducted to evaluate the clinical efficacy of aloe vera containing toothpaste and compare with conventional fluoride toothpaste as an adjunct to scaling in plaque induced moderate to severe chronic gingivitis patients.

SUBJECTS AND METHODS:

Sixty subjects in the age group of 18-35 years with plaque induced moderate to severe chronic gingivitis (as established on the basis of clinical parameters) were selected for randomized, controlled cross over clinical trial from Outpatient Department of Periodontology. Subjects who fulfilled the following inclusion and exclusion criteria were considered for the study.

Inclusion Criteria:

- Age group of 18 to 35 years and presence of at least ≥ 20 teeth

- Clinical signs of gingivitis
- Probing depth of < 3 mm with no evidence of clinical attachment loss.
- Systemically healthy & co-operative subjects
- No history of periodontal therapy or previous use of antibiotics or anti-inflammatory medication within the last 6 months.

Exclusion Criteria:

- Subjects undergoing orthodontic treatment
- Subjects with known allergies to the constituents of the formulations.
- Pregnant, lactating females & those on contraceptive pills.
- Subjects with history of over the counter use of anti-oxidants such as vitamin C, vitamin E or β -carotene within the past 3 months.
- Smokers & tobacco users.
- Medically compromised subjects.

The study was conducted in the Department of Periodontology from January 2014 to September 2015. Approval by the Ethical Committee was obtained before commencement of the study. A detailed case history of subjects was recorded. They were informed about the nature of the investigation and in written signed consent was obtained from the subjects participating in the study. Orthopantomogram (OPG) were taken to exclude subjects with underlying periodontal disease. Two weeks before the commencement of the study, subjects received an intraoral examination and a full mouth oral prophylaxis with the help of Piezoelectric scaler (SatelecTM) in single sitting. Subjects were instructed to brush their teeth for 1 minute, twice daily using modified bass technique with soft bristled tooth brush with customized formulated toothpaste with no antibacterial and anti-inflammatory properties. They were also asked to refrain from any other oral hygiene procedures throughout the study period. Two weeks later, Oral hygiene index (Greene and Vermillion, 1960), Plaque index (Silness P & Loe H, 1964), Sulcus bleeding index (Muhlemann H.R. & Son S. 1971) and Gingival index (Loe H & Silness J, 1963) were recorded as baseline recordings. Then subjects were randomly divided into aloe vera group & conventional groups having 30 subjects each. They were given aloe vera toothpaste and conventional toothpaste respectively and instructed to brush their teeth for 1 minute, twice daily

using modified bass technique with soft bristled tooth brush for 4 weeks. Same parameters were recorded after 2 and 4 weeks. Wash out period of 2 weeks was followed between two study periods. Subjects were given a customized formulated toothpaste with no antibacterial and anti-inflammatory properties during wash out period. At the end of each study period scaling was done to remove accumulated deposits and the study was repeated in cross over. [Figures: 1,2,3,4]

Study period – 1 (Before crossover)

- Group A: scaling was done and aloe vera toothpaste (Aloe plus™) was given

- Group B: scaling was done and conventional fluoridated toothpaste (Colgate Dental Cream™) was given

Study period – 2 (After crossover)

- Group A: scaling was done and conventional fluoridated toothpaste (Colgate Dental Cream™) was given
- Group B: scaling was done and aloe vera toothpaste (Aloe plus™) was given



Figure 1: Aloe vera group before crossover



Figure 2: Conventional group after crossover



Figure 3: Conventional group before crossover



Figure 4: Aloe vera group after crossover

RESULTS:

The change in mean scores of various indices over a period of 4 weeks in each group before and after crossover was analyzed using Repeated measures ANOVA test. On intragroup comparison it was observed that there was significant reduction in plaque index, gingival index, sulcus bleeding and oral hygiene index scores at 4 weeks when compared to baseline (p value < 0.001) before and after crossover in both aloe vera and conventional group [Table-1]. However on intergroup comparison the results were statistically non-significant in both aloe vera and conventional group [Table 2]. [Graphs 1,2,3,4].

Table 1: Intragroup comparison of plaque, gingival, sulcus bleeding and oral hygiene index scores

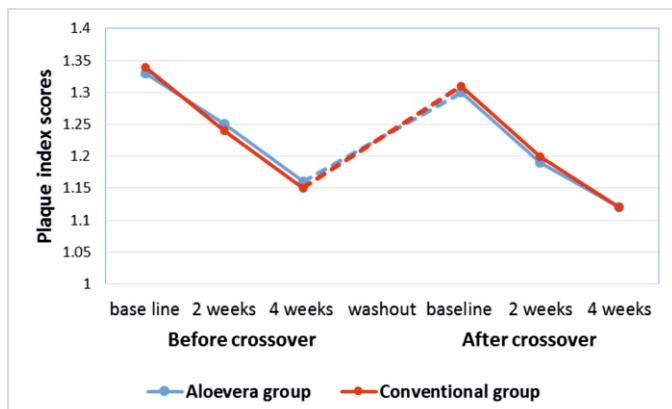
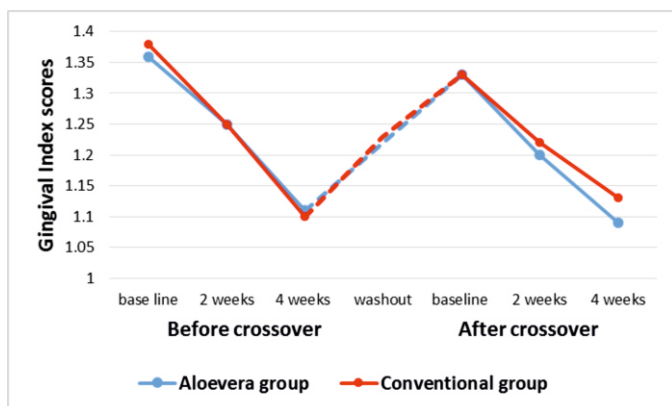
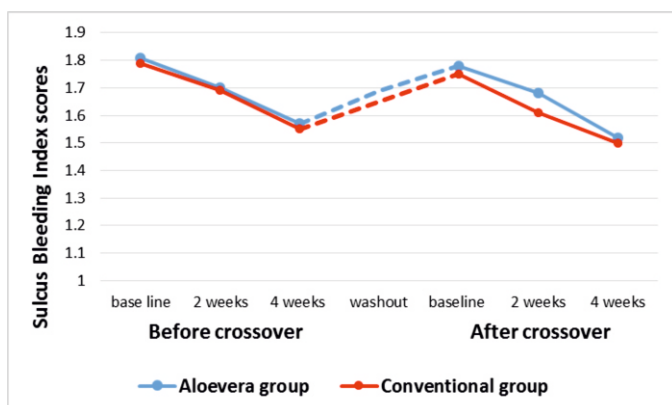
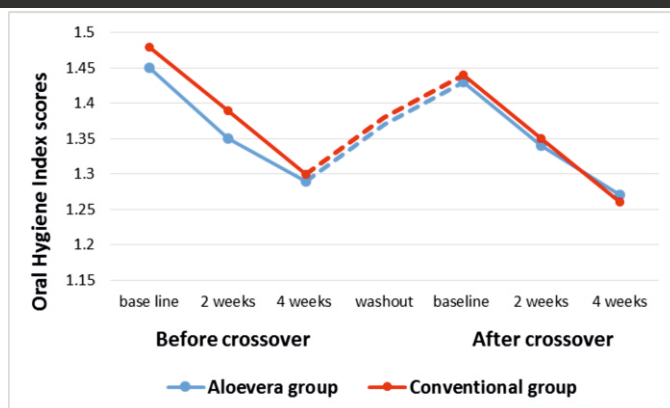
PI score	Before crossover						After crossover					
	Baseline	2 weeks	4 weeks	Mean Change	% reduction	P (Repeated measures ANOVA)	Baseline	2 weeks	4 weeks	Mean Change	% reduction	P (Repeated measures ANOVA)
PI score												
Aloe vera Group	1.33 ± 0.37	1.25 ± 0.35	1.16 ± 0.33	0.17 ± 0.12	12.8%	< 0.001*	1.30 ± 0.26	1.19 ± 0.26	1.12 ± 0.25	0.18 ± 0.09	13.8%	< 0.001*
Conventional Group	1.34 ± 0.36	1.24 ± 0.35	1.15 ± 0.32	0.19 ± 0.06	14.2%	< 0.001*	1.31 ± 0.33	1.20 ± 0.32	1.12 ± 0.30	0.19 ± 0.05	14.5%	< 0.001*
GI score												
Aloe vera Group	1.36 ± 0.37	1.25 ± 0.31	1.11 ± 0.27	0.25 ± 0.20	18.4%	< 0.001*	1.33 ± 0.27	1.20 ± 0.32	1.09 ± 0.26	0.24 ± 0.06	18.0%	< 0.001*
Conventional Group	1.38 ± 0.32	1.25 ± 0.30	1.10 ± 0.28	0.28 ± 0.14	20.3%	< 0.001*	1.33 ± 0.30	1.22 ± 0.27	1.13 ± 0.29	0.20 ± 0.18	15.0%	< 0.001*
OHI score												
Aloe vera Group	1.45 ± 0.35	1.35 ± 0.35	1.29 ± 0.37	0.16 ± 0.10	11.0%	< 0.001*	1.43 ± 0.31	1.34 ± 0.32	1.27 ± 0.31	0.16 ± 0.06	11.1%	< 0.001*
Conventional Group	1.48 ± 0.37	1.39 ± 0.37	1.30 ± 0.38	0.18 ± 0.07	12.2%	< 0.001*	1.44 ± 0.28	1.35 ± 0.30	1.26 ± 0.30	0.18 ± 0.06	12.5%	< 0.001*
SBI score												
Aloe vera Group	1.81 ± 0.49	1.70 ± 0.48	1.57 ± 0.46	0.24 ± 0.06	13.3%	< 0.001*	1.78 ± 0.43	1.68 ± 0.44	1.52 ± 0.43	0.26 ± 0.07	14.6%	< 0.001*
Conventional Group	1.79 ± 0.54	1.69 ± 0.54	1.55 ± 0.53	0.24 ± 0.05	13.4%	< 0.001*	1.75 ± 0.44	1.61 ± 0.42	1.50 ± 0.42	0.25 ± 0.11	14.3%	< 0.001*

* $p \leq 0.05$ is statistically significant

Table 2: Intergroup comparison of plaque, gingival, sulcus bleeding and oral hygiene index scores

PI score	Aloe vera Group	Conventional Group	P value (Unpaired t test)
Before Crossover	0.17 ± 0.12	0.19 ± 0.06	0.442
After Crossover	0.18 ± 0.09	0.19 ± 0.05	0.587
GI score			
Before Crossover	0.25 ± 0.20	0.28 ± 0.14	0.533
After Crossover	0.24 ± 0.06	0.20 ± 0.18	0.298
OHI score			
Before Crossover	0.16 ± 0.10	0.18 ± 0.07	0.209
After Crossover	0.16 ± 0.05	0.18 ± 0.06	0.290
SBI score			
Before Crossover	0.24 ± 0.06	0.25 ± 0.05	0.553
After Crossover	0.26 ± 0.07	0.25 ± 0.11	0.725

* $p \leq 0.05$ is statistically significant

**Graph no.1: Change in Plaque Index before and after crossover among aloe vera group and conventional group.****Graph no.2: Change in Gingival Index before and after crossover among aloe vera group and conventional group.****Graph no.3: Change in Sulcus Bleeding Index before and after crossover among aloe vera group and conventional group.****Graph no.4: Change in Oral Hygiene Index before and after crossover among aloe vera group and conventional group.**

DISCUSSION:

In the present study, aloe vera toothpaste was found to be effective in reducing the plaque and gingival index score to a statistically significant level ($p < 0.001$). Pradeep AR et al 2012^[6] Namiranian H and Serino G 2012^[7] and Oliveria SM et al 2008^[8] reported similar results.

The reduction in plaque index scores obtained in the present study could be attributed to the antibacterial properties of aloe vera. Lee et al 2004^[9] who studied antimicrobial effect of aloe vera in vitro and reported to inhibit the growth of diverse oral microorganisms such as Streptococcus mutans, Streptococcus sanguis, Actinomyces viscosus and Candida albicans. Another in vitro study by George D et al 2009^[10] has also shown that aloe vera tooth gel was equally effective as Pepsodent and Colgate toothpaste in controlling Streptococcus mutans, Candida albicans, Lactobacillus acidophilus, Streptococcus mitis, Enterococcus faecalis, Prevotella intermedia and Peptostreptococcus anaerobius.

Use of aloe vera toothpaste resulted in significant reduction in gingival index score, which can be attributed to its anti-inflammatory, antibacterial, wound healing properties. Carboxypeptidase present in aloe vera inactivates bradykinin thereby reducing prostaglandin synthesis and inhibiting oxidation of arachidonic acid, which might decrease inflammation and relieve pain. Magnesium lactate present in aloe vera inhibits histidine decarboxylase, thereby preventing the formation of histamine from histidine in mast cells.^[9] Rocio Bautista 2004^[11] showed that carboxypeptidase in aloe vera had good anti-prostaglandin synthesis properties and compounds inhibiting oxidation of arachidonic acid, which might decrease inflammation. The decrease in gingival index can also be attributed to presence of sterols as anti-inflammatory agents and lupeol as an antiseptic analgesic.^[11]

Vazquez B et al 1996^[12] stated that aloe vera decreases edema and number of neutrophils and also prevents migration of polymorphonuclear leucocytes.

Home-use toothpaste studies are often influenced by a number of factors. Another crucial factor is the Novelty effect, which is the motivation of oral hygiene practice by the use of a new substance. One of the main disadvantages in a toothpaste study is the effect of another ingredient in the formulation, the supposed active ingredient and this could lead to biased results. The aloe vera toothpaste used in the present study contains other agents (triclosan) that can promote a moderate antiplaque effect. Since this component is also present in the conventional toothpaste and considering that no difference was found between groups, one can conclude that the herbal agent had no influence on the results.

Within the limitations of this clinical study, it was found that in subjects who maintained good to fair oral hygiene, the toothpaste containing aloe vera did not show any additional effect on plaque and gingivitis compared to the conventional fluoridated toothpaste.

Conflicting Interest: Nil

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